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(54) Title: HYBRIDIZATION-BASED BIOSENSOR CONTAINING HAIRPIN PROBES AND USE THEREOF

(57) Abstract: A sensor chip that includes: a fluorescence quenching surface; a nucleic acid probe that contains first and second ends with the first end bound to the fluorescence quenching surface, a first region, and a second region complementary to the first region, the nucleic acid probe having, under appropriate conditions, either a hairpin conformation with the first and second regions hybridized together or a non-hairpin conformation; and a first fluorophore bound to the second end of the first nucleic acid molecule. When the first nucleic acid molecule is in the hairpin conformation, the fluorescence quenching surface substantially quenches fluorescent emissions by the first fluorophore; and when the first nucleic acid molecule is in the non-hairpin conformation, fluorescent emissions by the fluorophore are substantially free of quenching by the fluorescence quenching surface. Various nucleic acid probes, methods of making the sensor chip, biological sensor devices that contain the sensor chip, and their methods of use are also disclosed.